

***NATIONAL WEATHER SERVICE INSTRUCTION 10-331***

***July 8, 2003***

***Operations and Services***

***MARINE AND COASTAL WEATHER SERVICE PROGRAM, NWSPD 10-3***

***GREAT LAKES ICE SERVICES***

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**NOTICE:** This publication is available at: <http://www.nws.noaa.gov/directives/>

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***SUMMARY OF REVISIONS:*** This directive supersedes NWSI 10-331, dated May 21, 2002.  
This directive updates information in product examples.

Signed

June 20, 2003

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Gregory A. Mandt  
Director, Office of Climate,  
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Date

## GREAT LAKES ICE SERVICES

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1. Introduction. Great Lakes ice services provide lake ice observations, forecasts, outlooks, and warnings during the months in which ice cover on the lakes and their connecting passages impacts shipping; usually between December and April. This instruction describes the NWS Great Lakes Ice Services.

#### 2. Great Lakes Products.

2.1 Great Lakes Ice Outlook. During the ice season, WFO Cleveland will issue a 5 day ice forecast/advisory product on Monday, Wednesday, and Friday of each week at about 4 p.m., local time. It should include expected synoptic weather patterns and temperatures over the next 5 days and expected winds for the first 36 hours of the period covered by the forecast. It should also include, when available, additional information such as normal temperatures, effects of ice on navigation, the accumulated freezing degree days, and observed ice thicknesses.

#### 2.2 Freeze-up Outlooks.

2.2.1 Great Lakes Freeze-Up Outlook. For Lakes above Lake Ontario, WFO Cleveland will issue a freeze-up outlook on about the 1<sup>st</sup> and 15<sup>th</sup> of each month from November through December depending on existing ice conditions. It will indicate whether ice conditions will occur earlier, later, or about the normal times over the Lakes, and should be consistent with the

30 and 90 day outlooks of the NIC. Include in the Outlook supporting data such as selected water temperatures from water intakes and from NOAA data buoys.

2.2.2 Outlook for Freeze-up on the St. Lawrence River. WFO Buffalo will issue an outlook for freeze-up on the St. Lawrence River at Massena, New York on or about the 1<sup>st</sup> and 15<sup>th</sup> of each month from November through December depending on existing ice conditions. It may be issued at other times if, in the forecaster's judgement, conditions significantly differ from the current outlook. The outlook should be consistent with 30 and 90 day outlooks of the NIC. Other ice products are normally not needed for Lake Ontario and the St. Lawrence River because the Welland Canal and the river usually close in December.

2.3 Great Lakes Ice Outlook for the Opening of Navigation. WFO Cleveland will issue this outlook once in the spring around March 1. Include a summary of current ice thicknesses and a listing of dates when shipping is expected to be able to navigate an area without icebreaker assistance across all the Lakes.

2.4 Ice Advisories. Forecasters will use the headline "Ice Advisory" in the ice forecast when, in their judgement, conditions are expected that could cause changes adversely affecting ships already underway or trapping ships that are not yet underway. Guidelines for the headlines are:

- a. Sustained winds of 25 KT or greater for a minimum of 12 hours. (These conditions are a concern because of the strong ice pressures that they generate.)
- b. The likelihood of rapid ice drift closing active shipping areas. Rapid ice drift is defined as a drift speed of greater than 10 nm per day for freely moving ice.
- c. A drop in temperatures which will result in moderate to rapid ice growth.

**APPENDIX A- EXAMPLES OF GREAT LAKES PRODUCTS**

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1. Great Lakes Ice Outlook. (This example would be typical of an early winter.)

(WMO HEADER)(Issuance Time)  
ICELIO

GREAT LAKES ICE FORECAST  
NATIONAL WEATHER SERVICE CLEVELAND OH  
400 PM EST (DAY OF THE WEEK...MON, WED, OR FRI)22 DEC 2000

A LOW NORTHEAST OF THE SAULT STE MARIE AREA WILL MOVE EAST AND OUT OF THE LAKES AREA TONIGHT. A COLD FRONT EXTENDING SOUTHWESTWARD FROM THE LOW THROUGH ILLINOIS WILL MOVE SOUTHEAST AND BECOME STATIONARY SOUTH OF THE LOWER LAKES. A SECOND LOW WILL MOVE OUT OF THE DAKOTAS AND ALONG THE FRONT PASSING OVER THE LOWER LAKES REGION ON MONDAY. A LOW NORTHEAST OF THE SAULT STE MARIE AREA WILL MOVE EAST AND OUT OF THE LAKES AREA TONIGHT. A COLD FRONT SOUTHWEST FROM THE LOW THROUGH ILLINOIS WILL MOVE SOUTHEAST AND BECOME STATIONARY SOUTH OF THE LOWER LAKES. ARCTIC HIGH PRESSURE WILL BUILD OVER THE LAKES INTO THE MIDDLE OF NEXT WEEK.

GALE WARNINGS ARE IN EFFECT TONIGHT FOR LAKE SUPERIOR AND LAKE MICHIGAN. WINDS WILL BECOME WEST TO NORTHWEST OVER ALL THE LAKES TONIGHT AND SATURDAY. OVER THE NORTHERN LAKES WINDS WILL BECOME NORTHEAST TO NORTH SUNDAY BACKING TO NORTHWEST AND WEST SUNDAY NIGHT.

TEMPERATURES WILL BECOME MUCH COLDER OVER ALL THE LAKES BY THE END OF THE WEEKEND WITH READINGS WELL BELOW NORMAL BY THE FIRST PART OF NEXT WEEK. ICE GROWTH WILL BECOME MODERATE TO RAPID IN ALL AREAS BY THE END OF THE WEEKEND. THE MOST SIGNIFICANT GROWTH IS LIKELY IN THE BAYS AND HARBORS ALONG LAKE SUPERIOR...SOUTHERN GREEN BAY...AND IN WESTERN LAKE ERIE FROM THE DETROIT RIVER LIGHT TO SOUTHEAST SHOAL. NAVIGATION COULD BECOME DIFFICULT IN THOSE AREAS BY NEXT WEEK.

THE COAST GUARD CUTTER KATMAI BAY IN THE LOWER ST MARYS RIVER REPORTED 30 PERCENT COVERAGE OF 1 INCH ICE FROM PT AUX FRENES TO SWEETS POINT. THERE WAS OPEN WATER FROM THE LOCKS TO PT AUX FRENES.

1.1 Monday Portion of the Ice Outlook (appended on Mondays)

NORMAL TEMPERATURES FOR SELECTED LOCATIONS AROUND THE GREAT LAKES FOR THE PERIOD 18 DECEMBER 2000 THROUGH 25 DECEMBER 2000:

LOCATION	HIGH	LOW	LOCATION	HIGH	LOW
-----			-----		
DULUTH, MN	49	30	MUSKEGON, MI	56	37
MARQUETTE, MI	48	28	ALPENA, MI	52	31
SAULT STE MARIE, MI	49	30	DETROIT, MI	59	38
GREEN BAY, WI	55	35	TOLEDO, OH	60	37
MILWAUKEE, WI	55	36	CLEVELAND, OH	59	39
CHICAGO, IL	60	40	BUFFALO, NY	55	37

1.2 Wednesday Portion of the Ice Outlook (appended on Wednesdays)

FREEZING DEGREE DAY ACCUMULATIONS AT SELECTED STATIONS THROUGH THE DAY (19 DECEMBER 2000) COMPARED TO NORMAL FOR THAT DAY:

LOCATION	2000	NORM	LOCATION	2000	NORM
-----			-----		
DULUTH, MN	500	580	MUSKEGON, MI	58	60
MARQUETTE, MI	443	450	ALPENA, MI	220	240
SAULT STE MARIE, MI	390	400	DETROIT, MI	50	62
GREEN BAY, WI	230	320	TOLEDO, OH	45	53
MILWAUKEE, WI	224	240	CLEVELAND, OH	10	12
CHICAGO, IL	113	120	BUFFALO, NY	100	110

1.3 Friday Portion of the Ice Outlook (appended on Fridays)

...ICE THICKNESSES AROUND THE GREAT LAKES BASED ON U.S. COAST GUARD REPORTS...

LOCATION	ICE THICKNESS IN INCHES
-----	-----
DULUTH	23 80 PERCENT
BAYFIELD	24
MARQUETTE	2
ST. IGNACE	12
ESCANABA	16
SHEBOYGAN	1
STURGEON BAY	10
CALUMET HARBOR	6 20 PERCENT
LUDINGTON	4 10 PERCENT
CHARLEVOIX	12
TAWAS	16
LORAIN	2
ASHTABULA	1
ERIE	2
BUFFALO	14

THIS FORECAST WILL NOT BE UPDATED UNTIL THE NEXT ISSUANCE 330 PM  
MONDAY 25 DEC.

LOMBARDY DEC 2000.

2. St. Lawrence Freeze Update Outlook.

(WMO Header)(Issuance Time)  
ICEFBO

ST LAWRENCE FREEZE UP DATE OUTLOOK  
NATIONAL WEATHER SERVICE BUFFALO NY  
1235 PM EST WED 15 NOV 2000

THE DATE OF THE FIRST FREEZE UP OF THE ST LAWRENCE RIVER NEAR  
MASSENA NEW YORK IS FORECASTED TO BE 1 JAN 2001.

LEVINE NOV 2000

3. Great Lakes Freeze Up Outlook.

(WMO Header)(Issuance Time)  
ICEFBO

GREAT LAKES FREEZE-UP OUTLOOK  
NATIONAL WEATHER SERVICE CLEVELAND OH  
400 PM EST WED 1 NOV 2000

FREEZE-UP IN THE BAYS AND HARBORS AROUND LAKE SUPERIOR AND  
NORTHERN LAKE MICHIGAN WILL OCCUR A LITTLE EARLIER THAN NORMAL  
THIS YEAR. FREEZE-UP AROUND SOUTHERN LAKE MICHIGAN AND NORTHERN  
LAKE HURON WILL OCCUR AROUND THE NORMAL TIMES WHILE

FREEZE-UP AROUND LAKE ERIE AND SOUTHERN LAKE HURON IS EXPECTED TO  
BE LATER THAN NORMAL THIS WINTER.

THE THIRTY DAY OUTLOOK FOR NOVEMBER IS FOR TEMPERATURES TO  
AVERAGE BELOW NORMAL AROUND THE LAKES REGION.

ANNUAL HARBOR WATER TEMPERATURES COMPARED TO PREVIOUS YEARS:

	2000	1999	1998	1997	1996	1995	1994
DULUTH	46	42	45	46	48	46	43
SAULT STE MARIE	48	48	46	46	50	46	44
CHICAGO	50	53	54	50	NA	NA	NA
MUSKEGON	54	54	56	47	56	52	48
ALPENA	51	49	51	47	49	45	44
DETROIT		54	52	55	50	54	51
CLEVELAND	61	59	61	55	57	53	52
BUFFALO	55	57	57	54	55	50	49

ANNUAL WATER TEMPERATURES FOR THE MID-LAKE AREAS AS RECEIVED FROM  
NOAA DATA BUOYS COMPARED TO PREVIOUS YEARS:

	2000	1999	1998	1997	1996
LAKE SUPERIOR					
WEST	44	42	43	45	45
NORTH-CENTRAL	43	43	44	44	42
EAST	43	46	44	45	44

LAKE MICHIGAN

NORTH	50	53	54	54	51
SOUTH	55	52	55	54	48

LAKE HURON

NORTH	49	51	50	49	49
SOUTH	52	50	53	50	50

LAKE ERIE

WEST	55	NA	60	54	55
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GARNET NOV 2000

4 Great Lakes Ice Outlook for the Opening of Navigation.

(WMO HEADER)(Issuance Time)  
ICEFBO

GREAT LAKES ICE OUTLOOK FOR THE OPENING OF NAVIGATION  
NATIONAL WEATHER SERVICE CLEVELAND OH  
400 PM EST MON 5 MAR 2001

THE FOLLOWING ARE THE LATEST ANNUAL ICE THICKNESS REPORTS:

DULUTH	13 INCHES
MARQUETTE	12 INCHES
WHITEFISH BAY	15 INCHES
ST. MARYS RIVER	14-20 INCHES
GREEN BAY	
ESCANABA	30 INCHES REMAINDER OF BAY NO REPORTS
STRAITS MACKINAC	12 INCHES
SAGINAW BAY	8 INCHES
LAKE ST. CLAIR	6-8 INCHES
WESTERN LAKE ERIE	6-10 INCHES
BUFFALO	20 INCHES

FOLLOWING ARE EXPECTED DATES WHEN ICE CONDITIONS BECOME SUCH THAT  
HIGH POWERED VESSELS CAN TRANSIT WITHOUT ICEBREAKERS:

DULUTH	APRIL 20
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MARQUETTE	APRIL 12
WHITEFISH BAY	APRIL 16
ST. MARY'S RIVER	APRIL 13
GREEN BAY	
ESCANABA	APRIL 7
REMAINDER OF BAY	APRIL 10
STRAITS OF MACKINAC	APRIL 8
GRAND TRAVERSE BAY	MARCH 20
SAGINAW BAY	MARCH 31
SOUTHERN LAKE HURON	MARCH 25
LAKE ST. CLAIR	MARCH 28
WESTERN LAKE ERIE	MARCH 31
BUFFALO	APRIL 22

BROWN            MAR 2001

5.    Great Lakes Ice Advisory.

ICELIO

GREAT LAKES ICE OUTLOOK  
NATIONAL WEATHER SERVICE CLEVELAND OH  
400 PM EST MON 29 FEB 2005

...AN ICE ADVISORY FOR LAKE SUPERIOR TUESDAY THROUGH FRIDAY...AN ICE ADVISORY WEDNESDAY THROUGH FRIDAY FOR BAYS AND HARBORS ON THE SOUTHERN WATERS OF LAKES MICHIGAN AND HURON...LAKE SAINT CLAIR AND WESTERN LAKE ERIE...

A DEEP LOW NEAR LAKE WINNIPEG TONIGHT WILL MOVE SOUTHEAST ACROSS LAKE SUPERIOR TUESDAY...CONTINUING SOUTHEAST OVER MICHIGAN WEDNESDAY AND THURSDAY...THEN CURVING NORTHEAST ACROSS LAKE ERIE FRIDAY. A STRONG HIGH WILL BE BUILDING IN BEHIND THIS LOW. A COLD FRONT SOUTHWEST FROM THE LOW CENTER TONIGHT WILL EXTEND ACROSS NORTHERN WISCONSIN TUE...AND MOVE SOUTHEAST ACROSS LAKE MICHIGAN WED.

WINDS WILL SHIFT TO NORTHWEST BEHIND THE FRONT AND INCREASE TO NEAR GALE FORCE OVER WESTERN LAKE SUPERIOR TUESDAY AND OVER LAKE MICHIGAN WEDNESDAY. THIS MAY CLOSE NAVIGATION ALONG CHANNELS AND BAYS WITH NORTHWESTERLY EXPOSURES FROM IRONWOOD TO COPPER HARBOR. WEST TO SOUTHWEST WINDS OVER THE EASTERN LAKES WILL SHIFT TO SOUTH AND SOUTHEAST LATER IN THE WEEK AS THE LOW APPROACHES.

TEMPERATURES WILL DROP TO WELL BELOW NORMAL THIS WEEK CAUSING SIGNIFICANT ICE FORMATION AND GROWTH. AS ARCTIC COLD AIR OVERSPREADS THE LAKES THIS WEEK...A SIGNIFICANT PERIOD OF ICE FORMATION AND GROWTH IS LIKELY ON SHALLOW WATER AREAS THROUGHOUT THE LAKES. ON THE NORTHERN WATERS...FORMATION WILL BE RAPID THROUGH TUESDAY...BECOMING MODERATE ON WEDNESDAY. THIS INCLUDES WHITEFISH BAY...THE SAINT MARYS RIVER...GREEN BAY AND THE STRAITS. ON SOUTHERN WATERS...MODERATE GROWTH AND FORMATION IS EXPECTED THROUGH TUESDAY WITH SLOW GROWTH AND FORMATION ON WEDNESDAY. THIS INCLUDES SAGINAW BAY...LAKE SAINT CLAIR AND THE WESTERN BASIN OF LAKE ERIE.

THE US COAST GUARD CUTTER BISCAYNE IN THE STRAITS OF MACKINAC MONDAY REPORTED 80% COVERAGE OF 3 TO 4 INCH ICE FROM LANSING SHOAL TO WHITE SHOAL AND 2 TO 3 INCHES OF ICE COVERING 40% OF THE AREA FROM THE BRIDGE TO ROUND ISLAND. THE SUNDEW IN THE DULUTH AREA REPORTED 6 TO 16 INCHES OF ICE IN DULUTH HARBOR AND 12 TO 20 INCHES OF ICE IN THE EAST GATE BASIN.

THIS FORECAST WILL NOT BE UPDATED UNTIL THE NEXT ISSUANCE 400 PM WEDNESDAY 2 MARCH 2005.

THURM FEB 05